



# Idaho Statewide Radio Communications Interoperability

## Executive Summary

September 24, 2008

CTA COMM#: 20160A

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## Executive Summary

The Idaho State Interoperability Executive Council (SIEC) has retained the services of CTA Communications to assist in planning the next generation of interoperable public safety radio communications for the State of Idaho. The current communications systems are described as “fragmented in ownership, operation and maintenance.” Our objective is to develop the plan for next generation communications in Idaho: a shared statewide network that will deliver uniform, highly interoperable communications for all local, tribal, and State public safety responders.

The SIEC’s main project goal is “to assess operational needs and technical resources that will define the overall operable and interoperable radio needs of the stakeholders.” CTA has accomplished the SIEC’s objectives through efforts organized in three main areas:

1. Perform a needs assessment of all local and State public safety and public service agencies
2. Evaluate alternative approaches and develop the conceptual system design based on the requirements of local and State users, including cost estimates, and implementation plans for the new systems
3. Develop design/build statement of work documents for inclusion in the subsequent procurement package

The results of these activities have been delivered in separate reports that include the research, interviews, engineering and system design that CTA completed in support of the recommendations. This executive summary is the culmination of the results delivered in the total project and highlights the most important results.

### The Statewide Assessment Process

CTA completed 79 **interviews** in 44 counties, including the three tribes and State agencies. Representatives from all public safety and service agencies active in each County were invited to attend. These interviews were conducted November 26 through December 14, 2007, and January 14 through February 8, 2008. Overall, there was a high level of interview participation. Seventy-nine (79) draft interview records were issued for comment, and forty-eight (48) responses were received. The resultant data has been used in the needs assessment and the analysis.

Fifty-three (53) **dispatch centers** were also visited and **surveyed**. These included the 44 County dispatch centers, City dispatch centers, Tribal centers, all three Idaho State Police centers, and the Federal Interagency Fire Dispatch Center. The surveys covered the operations, facilities and equipment.

CTA issued a **Technical Site Survey**, soliciting radio tower site information, from 44 counties, 3 tribes and the State. The purpose of this survey was to obtain local tower site asset information that would augment the 2004 State information, enable conceptual site selection and facilitate cost estimates. Fifty-four (54) technical site surveys were distributed. Forty-seven (47) surveys were returned for an 87% response rate.

CTA also deployed a web-based **Operational Survey**. The objective was to reach out to radio users that we were unable to attend interviews and to offer a means for follow up inputs.

This survey solicited information in five key areas:

- Interoperability - today's situation and future needs
- Current radio problems
- Future radio requirements
- Quantities of people and vehicles needing to be equipped with radios
- Additional comments

The survey started on February 28, 2008 and concluded on April 30, 2008. The goal was to obtain a response one spokesperson from each stakeholder agency in the State. 640 surveys were issued, while 322 were returned for a 50% response rate. There was at least one response from each discipline in each County. The breakdown of the survey responses by discipline is as follows:

| <b><u>Discipline</u></b> | <b><u>Number of Surveys Returned</u></b> |
|--------------------------|--|
| Law Enforcement          | 89                                       |
| Fire                     | 99                                       |
| EMS                      | 74                                       |
| Emergency Management     | 26                                       |
| County Commissioner      | 5  |
| Other                    | 29                                       |
| Total                    | 322                                      |

As a result of these activities, CTA has assembled a complete picture of local and State public safety communications in Idaho, which we summarized in the **Needs Assessment Report**. The report contains a discussion of the following topics for each County, Tribe, and the State agencies.

- Operational environment
- Interoperability
- Communications (dispatch center) environment
- Radio site information
- User radio inventory and other assets
- In-process communications improvements
- Description of current problems
- Future requirements
- Radio coverage maps
- Interoperability analysis (on a regional basis)

Each County was offered the opportunity to review the draft assessment report. We received feedback from seventeen counties, one Tribe and three State agencies, all of which were incorporated into the final document.

### Needs Assessment Summary

Based on information gathered during interviews, online surveys, technical surveys, and from the County communication plans, CTA identified several problem areas that hamper communications using existing radio systems throughout the State. Public safety radio users were offered the opportunity to rank the severity of these problems according to the impact on their daily mission. TABLE ES-1 summarizes the users' evaluation of communications problems.

The results indicate the most severe problems are the inability of the equipment to support new technologies, limited coverage and poor interoperability. These problem areas aligned with concerns expressed to CTA during our interviews. Emergency responders throughout the State are looking to the new radio system to solve these problems.

Communications interoperability surfaced as a major problem area. Public safety personnel need the ability to communicate easily and flexibly during any situation they find themselves in. Interoperability is the ability of public safety personnel to use their radios to quickly communicate with all response team members. Communications must transparently span disciplines; law, fire, EMS, and public service. Likewise, agency members must easily communicate across jurisdictional lines with organizations in other counties, districts, and regions, while receiving or offering outside assistance.

The Department of Homeland Security has developed a set of broadly accepted measures of interoperable communications abilities. These metrics are known as the SAFECOM Interoperability Continuum. We evaluated the current situation in Idaho against four of these measures:

- Technology
- Standard Operating Procedures
- Governance
- Usage (how often agencies practice coordinated activities)

FIGURES ES-1 through ES-4 illustrates CTA's assessment of the counties, tribes, districts, and State agencies current placement on the SAFECOM continuums. On each continuum, the left side indicates lower capabilities and the right side indicates higher and more mature capabilities. We observe from these assessments that districts that have taken the initiative to work together, and those that share more capable communications systems, tend to be the leaders in these four interoperability measures.

In some areas of the State, high levels of interoperability have been achieved using shared channels and interagency agreements. Throughout the central portion of the State in Lincoln, Jerome, Twin Falls, and Gooding counties, a conventional simulcast system provides excellent interoperability. In other counties shared channels are used to facilitate interoperability.

The current radio environment consists of a combination of systems using the VHF, UHF and 700 MHz frequency bands. For the most part, each County has its own system of radio frequencies and tower sites from which it operates. The combination of multiple frequency bands and segregated systems gets in the way of effective intercommunications.

Utilization of multiple radio frequency bands presents a major obstacle to interoperable communications. Traditionally, user radios only operate in a single frequency band. The employment of multiple bands necessitates either duplicate coverage or radio equipment. FIGURES ES-5 through ES-7 illustrates the mix of radio bands currently in use throughout the State for law enforcement, fire agencies and EMS/ambulance. VHF is the predominant band for fire and EMS/Ambulance. Law enforcement agencies are primarily using UHF in the north, south and eastern portion of the State and VHF throughout the less populated areas in the north central and northeast.

### Future Interoperable Radio System Requirements

CTA surveyed radio users on the importance of various "positive attributes" that could be emphasized in the future communications system design. A summary of these attributes along with Idaho user rankings is presented in TABLE ES-2. We found consistency between the top ranked attributes and the message reported during interviews with public safety responders.

As we processed all the information amassed during the needs assessment, several defining requirements became clear. These defining requirements came from the SIEC project direction, directly from user inputs, and from analysis of the interoperability needs.

These requirements must be satisfied in a successful design and project:

- **Ease of Operation:** Radio communications must be easy for the user to operate under mission pressure. Complicated solutions tend to go underutilized. Adequate training is critically important to the project success.
- **Adequate Radio Coverage.**
- **Facilitate Interagency Cooperation:** A shared communications network must facilitate cooperation along with effective governance structures and SOPs.
- **Level 3 Moving to Level 5 Interoperability:** The State of Idaho is appropriately seeking the higher levels of SAFECOM-defined interoperability using standards-based technology.
- **Federal Interoperability:** The high proportion of federal land in Idaho dictates effective communications with Federal agencies in order to be properly prepared for natural disasters.
- **Reliability:** Systems must be robust in design and construction and be dependable and available under man-made and natural disaster situations. Many Idaho systems today are not reliable. Many of the counties do not have budgets sufficient to maintain proper radio systems. Even if initial equipment is provided for counties, ongoing support must be planned into the project for continued high reliability.
- **Cost:** Many of the counties have large numbers of volunteers that have purchased their own radios in the past. The concern is that new, digital, P25 radios will be cost prohibitive for the volunteers. Local cost concerns extend to developing and maintaining new radio infrastructure. Idaho must consider both initial cost and ongoing maintenance costs.
- **Project Schedule and Strategy:** Current UHF and VHF systems must be upgraded to narrowband by 2013. About 40% of the counties are not prepared for the deadline. By aggressively pursuing the 700 MHz project, and through strategic scheduling and regional implementation, some upgrade funding may be avoided.

### System Alternative Analysis

An important step in the planning process is to identify and evaluate architectural alternatives that could potentially fulfill the requirements. The SIEC requested that CTA examine two conceptual system design alternatives.

1. Statewide 700 MHz System with a VHF Overlay
2. Statewide 700 MHz System

As part of this evaluation, we were asked to validate the conclusions from the Idaho Feasibility Study completed by ICTAP in June of 2005. This study considered the interoperability benefits of Project 25 technology, the various frequency band alternatives, radio coverage that might be achieved from State sites in the various bands, and a general discussion of financial impacts of the various choices.

We concluded, after considering the results of our needs assessment, and reviewing previous work, that both alternatives are viable approaches and worthy of in-depth analysis in our quest for a workable solution that satisfies Idaho's interoperable communications goals.



Each alternative was examined for the results it would produce. Critical operational considerations and interoperation aspects were considered with a focus on how each design approach would affect daily operation. We also considered rough order of magnitude cost comparisons. Finally, we performed our Impact Analysis evaluation, which solicits inputs from a broad range of CTA professionals on each alternative's ability to deliver the Future Attributes requested by Idaho public safety and service users.

Alternative 1, the 700 MHz system with VHF band overlay, was eliminated largely because the hybrid two-band would result in some unworkable interoperability problems and create an unnecessarily complicated environment for radio users.

We concluded that alternative 2, the Statewide 700 MHz System, is the most viable architecture for meeting the shared system project objectives. The concept provides for continued VHF communications with federal agencies, but does not include a VHF overlay.

We reach this conclusion based on small differences in initial cost, lower risk of unforeseen interoperability costs, and higher probability of achieving the stated project goal of Level 5 interoperability.

We have identified several strengths of the selected 700 MHz System alternative:

- Unified shared systems statewide for ease of operation
- Interoperability
- Coverage
- Reliability
- Emergency access
- Ability to support new technologies
- System operational transparency
- Commonality of equipment

### Conceptual System Design

Idaho's public safety community stands at the threshold of revolutionary advances in public safety radio communications. The proposed shared statewide concept will provide benefits far greater than a collection of local efforts could hope to achieve. CTA Communications is convinced that each agency will find that uniform, interoperable communications deployed across Idaho can eliminate a major barrier to our ultimate objective; delivery of excellent public safety services.

With major changes come challenges. Each public safety and service agency, County, State, or Tribe, is challenged to understand and accept the concept of statewide shared communications. They need to approach this major communications upgrade with a positive attitude, trusting and recognizing that in the long run, cooperative and shared communications will be the best, most cost effective solution.

During conception of this shared statewide communications plan, many technical and operational aspects have been considered. In summarizing this new approach to Idaho Public Safety communications, the main practical benefits that each user will receive once the plan is fully implemented include:

- **Simplified communications** – gone are the many frequency band barriers and differences in equipment and capabilities from area to area.
- **Communicate as needed** – within the guidelines of organizational structure, users can push to talk with those they need to. Equipment is no longer a barrier and with cooperative agreements, political boundaries are less of a barrier. The tools are in place for true interoperable communications.

- **Consistently dependable systems** – uniform design, deployment, operation, and maintenance of the systems mean that robust equipment has been designed for the task, placed where it's needed, and users can depend on reliable service every day.

With strong leadership, fair stakeholder representation, determination, and professional assistance, Idaho can accomplish this worthy goal of drastically improved public safety communications.

Our conceptual design is based upon the industry-accepted Project 25 interoperability standard. The main benefit of the Project 25 standard is that users can readily communicate with each other without the barriers of proprietary technology. Standards-based equipment enables radios from different manufactures to work together. This foundation benefits the local Idaho community on a daily basis and during occasional events when help arrives from out of State.

A network of 121 700 MHz radio tower sites, shared among counties and agencies, replace approximately 300 existing transmission points. The combination of asset sharing and standards-based competitive procurement will provide more uniform, reliable services and save the State money over the long term. The 700 MHz system investments made to date are meshed into the conceptual design.

The network is linked over the existing State microwave network with appropriate expansions to reach new locations. All 44 dispatch centers, tribal centers, and State agency dispatch points are linked into the network to facilitate district and regional communications when needed. The microwave network expansions needed for radio are planned to mesh with the State broadband and other initiatives. The microwave system functions as a multi-use, network backbone.

VHF radio systems are necessary for intercommunications with federal agencies in areas of public lands in Idaho. There is no formal VHF overlay in the concept; however, equipment in this band, also P25 capable, is recognized to play a continued role in areas of Idaho. We anticipate that redistribution of existing VHF narrowband assets will hold down the cost of sustained federal intercommunications. The master sites and network backbone built up as part of the 700 MHz project will facilitate improved interconnectivity of VHF equipment. This infrastructure is also capable of interconnecting federal systems in Idaho should opportunities for partnership come to fruition.

### Opinion of Probable Cost

CTA developed an opinion of probable cost for the major categories of equipment in the conceptual system design. The cost estimates were derived from historical CTA cost data and vendor pricing of recent comparable projects. Costs are indicated for competitive multi-vendor, and negotiated single vendor environments.

|  | Non-Competitive Estimate | Competitive Estimate |
|--|--------------------------|----------------------|
| Total Voice and Mobile Data Project Cost             | \$334M                   | \$293M               |
| Included in the total above:<br>User Radio Equipment | \$191M                   | \$168M               |

### Implementation Plan

The change from the current mix of VHF, UHF and 700 MHz radio systems to a system of coordinated, statewide, shared communications will present challenges. Our implementation plan explains these challenges and sheds light on the major tasks that all stakeholders may not be aware of. We present our unbiased opinion, after having

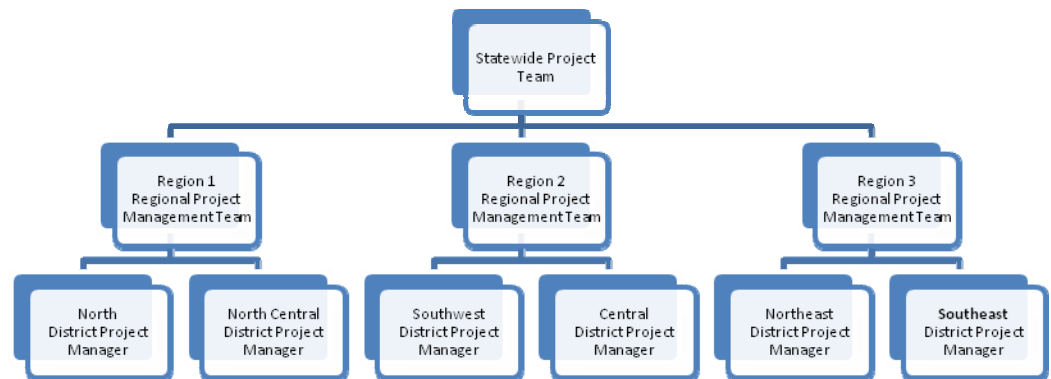


studied Idaho's situation and the steps taken thus far, on how to organize the project into a sensible, goal-oriented, and fiscally responsible plan.

The migration of the current mixture of radio systems and frequency bands is a large undertaking and a multi-level project management team must be put in place. The team will manage a phased project that focuses on achieving early successes with realistic milestones that will provide immediate benefit to agencies across Idaho.

The project team will be structured in three levels, as shown in the organizational chart below. We encourage a high level of County representation in each of the three levels of project management. This diverse team will fine tune the implementation plan, direct the project, monitor the daily status, redistribute assets, work with localities gaining buy-in and support, and respond to and solve problems in a quick and professional manner.

Qualified personnel from each County should serve on the State, Regional, and District level project team. In this manner, the project management team will be better able to gain local buy-in since all decisions will be made with the input of local representatives.



The phased implementation approach is recommended due to the complexity of the project, the number of facilities and agencies involved, and the relatively short construction season at a majority of the mountaintop sites. A phased approach combined with a good understanding of the current radio systems will help to maintain interoperability and operational effectiveness throughout the implementation process.

The project is divided into four phases:

Phase 0, Implementation Planning:

- Project Management Team Assembled
- Implementation Planning
- Governance Structure Development
- User Agreements and MOUs

Phase 1, Backbone Implementation and Region Build-out Planning:

- Region Build-out Planning
- Microwave backbone upgrades
- Installation of Region 1 and 3 master sites
- Implementation of the currently funded 700 MHz sites

Phase 2, Regional Build-out:

- Complete counties in Region 3

- Complete prioritized counties in Region 2
- Manage 2013 narrowband compliance

#### Phase 3, Completion

- Complete remaining counties in Region 2
- Complete all counties in Region 1

### Recommendations

With strong leadership, fair stakeholder representation, determination, and professional assistance, Idaho can accomplish this worthy goal of improved public safety communications.

- Review and formally approve proposed conceptual design.
- Build consensus at the local level for statewide next-generation communications.
- Secure the necessary funding commitment for phased project implementation.

#### Recommended Next Steps:

Carefully consider the implementation planning topics contained in the Conceptual Design report. The important project management activities as well as the technical considerations provided will serve as a guide as Idaho moves into statewide implementation.

- Assemble the Idaho “Implementation Team”. This will include the SIEC Technical Committee and representatives from the counties, tribes, districts, and regions. The immediate goals will be to:
  - build consensus for the statewide concept at the local level
  - involve the localities in the phased implementation
- Develop the detailed Implementation Plan.
- Commence procurement activities. CTA has provided, as a part of this project, the design/build SOW documents for procurement of the entire statewide radio system. With CTA’s assistance, assemble Requests for Proposals according to the identified project phases.

Your CTA team has developed a large body of knowledge over the course of this project. We stand ready, and look forward, to assisting Idaho during the implementation phase of next generation public safety communications.

**Table ES-1**  
**Current Radio Systems - Relative Problem Ranking**

| <b>Problem</b>                            | <b>Average for All Agencies</b> | <b>FIRE</b> | <b>Law Enforcement</b> | <b>EMS</b> |
|---|---------------------------------|-------------|------------------------|------------|
| Lacks Ability to Support New Technologies | 2.7                             | 2.9         | 2.6                    | 2.4        |
| Limited Coverage                          | 2.7                             | 2.8         | 2.4                    | 2.6        |
| Lacks Regional Interoperability           | 2.7                             | 2.7         | 2.7                    | 2.2        |
| Lack of Interoperability                  | 2.6                             | 2.6         | 2.6                    | 2.3        |
| Poor Handheld Operation                   | 2.3                             | 2.1         | 2.5                    | 2.1        |
| Channel Crowding                          | 2.1                             | 2.2         | 2.3                    | 1.8        |
| Poor Reliability                          | 1.9                             | 1.9         | 1.9                    | 1.9        |
| Channel Congestion                        | 1.9                             | 1.8         | 2.2                    | 1.6        |
| Local Interference                        | 1.6                             | 1.6         | 1.6                    | 1.5        |
| Maintenance Issues                        | 1.5                             | 1.6         | 1.5                    | 1.3        |
| Cumbersome Operation                      | 1.2                             | 1.3         | 1.2                    | 0.9        |

**Table ES-2**  
**Future Systems Desirable Attributes - User Ranking**

| ATTRIBUTE                           | Average for All Agencies | FIRE | Law Enforcement | EMS |
|-------------------------------------|--------------------------|------|-----------------|-----|
| Coverage                            | 4.7                      | 4.7  | 4.7             | 4.6 |
| Reliability                         | 4.6                      | 4.5  | 4.7             | 4.6 |
| Survivability                       | 4.4                      | 4.3  | 4.5             | 4.4 |
| Maintainability                     | 4.4                      | 4.3  | 4.5             | 4.3 |
| Interoperability                    | 4.3                      | 4.2  | 4.5             | 4.2 |
| Emergency Access                    | 4.3                      | 4.2  | 4.4             | 4.4 |
| Power Backup                        | 4.2                      | 4.1  | 4.4             | 3.9 |
| Training                            | 4.1                      | 4.2  | 4.1             | 4.0 |
| Capacity                            | 4.0                      | 4.0  | 4.1             | 4.0 |
| Regional Interoperability           | 4.0                      | 4.0  | 4.1             | 3.7 |
| Intercommunications                 | 4.0                      | 3.9  | 4.0             | 3.9 |
| Support New Technologies            | 4.0                      | 3.8  | 4.1             | 3.7 |
| Future Expansion                    | 3.9                      | 3.9  | 4.0             | 3.8 |
| Commonality of Equipment            | 3.9                      | 3.9  | 4.0             | 3.8 |
| State and Federal Interoperability  | 3.8                      | 3.8  | 3.8             | 3.4 |
| Operational Boundary Flexibility    | 3.7                      | 3.5  | 3.6             | 3.6 |
| Dispatch Operational Concept        | 3.6                      | 3.6  | 3.7             | 3.4 |
| Reduced Congestion                  | 3.6                      | 3.6  | 3.6             | 3.6 |
| System Operational Transparency     | 3.6                      | 3.4  | 3.7             | 3.4 |
| Flexibility in Personnel Allocation | 3.5                      | 3.5  | 3.3             | 3.4 |
| Console Features                    | 3.3                      | 3.0  | 3.5             | 2.9 |
| Non-fixed Radio Features            | 3.3                      | 3.0  | 3.4             | 3.9 |
| Encryption                          | 2.6                      | 1.9  | 3.3             | 2.2 |

#### Ratings

**0 - Attribute is NOT IMPORTANT to the user.**

**1 - Attribute is MINIMALLY IMPORTANT to the user.**

**2 - Attribute is NICE TO HAVE, could enhance operations.**

**3 - Attribute is USEFUL, will promote more efficient day to day operation.**

**4 - QUITE IMPORTANT, lack could result in degradation of mission, injury, or loss of property.**

**5 - CRITICAL, lack generally will result in injury, loss of property, or degradation of mission.**

# Figure ES-1

## Placement on SAFECOM Interoperability Continuum - Technology

**Technology:**

Swap Radios

Gateway

Shared  
Channels

Proprietary Shared  
Systems

Standards-Based  
Shared Systems

(Includes using a 2<sup>nd</sup> Radio)

District 1  
District 2  
District 3  
District 4  
District 5  
District 6  
State Agencies  
Tribes

700 MHz P25  
Ada County  
Bannock County  
Bingham County

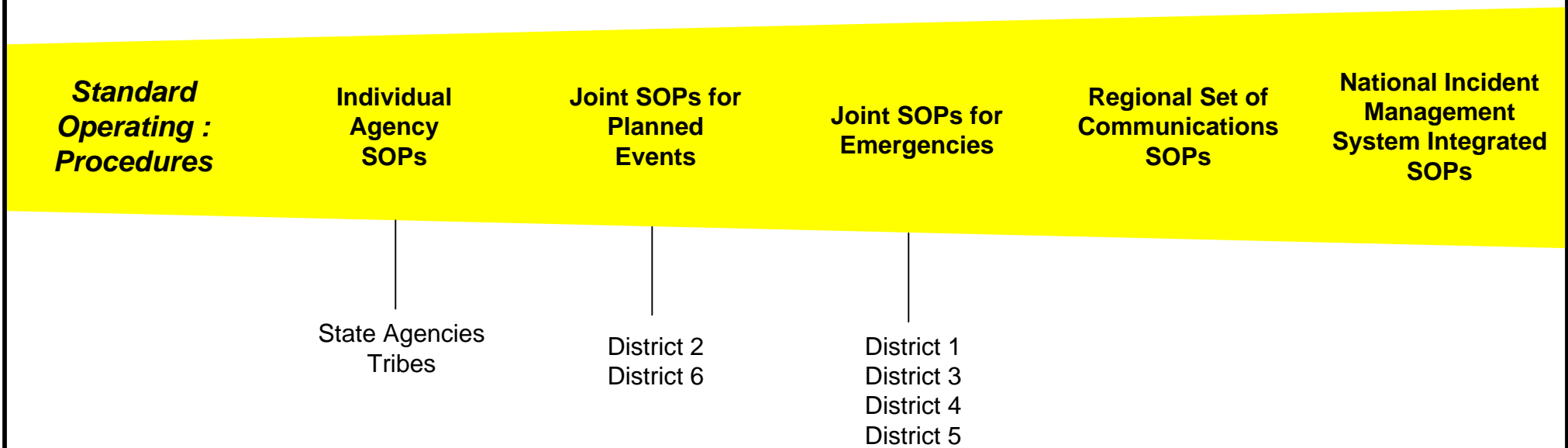
CTA Communications  
A Division of HSMM

HSMM | AECOM

# Figure ES-2

## Placement on SAFECOM

### Interoperability Continuum – Standard Operating Procedures



CTA Communications  
A Division of HSMM

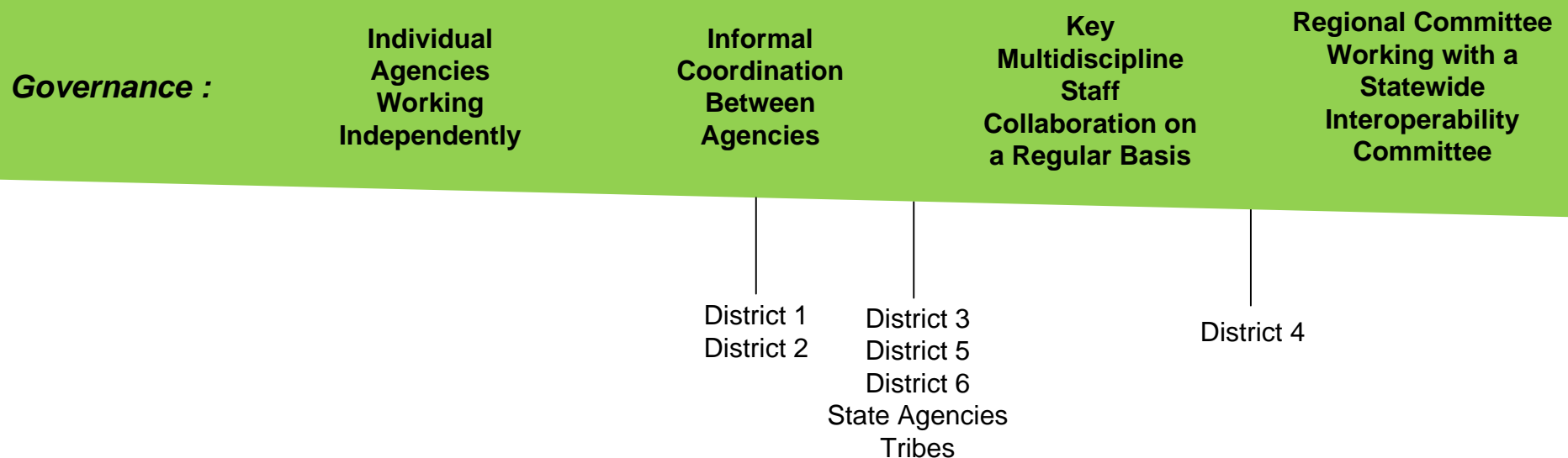
HSMM | AECOM



# Figure ES-3

## Placement on SAFECOM

### Interoperability Continuum – Governance



CTA Communications  
A Division of HSMM

HSMM | AECOM

# Figure ES-4

## Placement on SAFECOM

### Interoperability Continuum – Usage



State  
Agencies

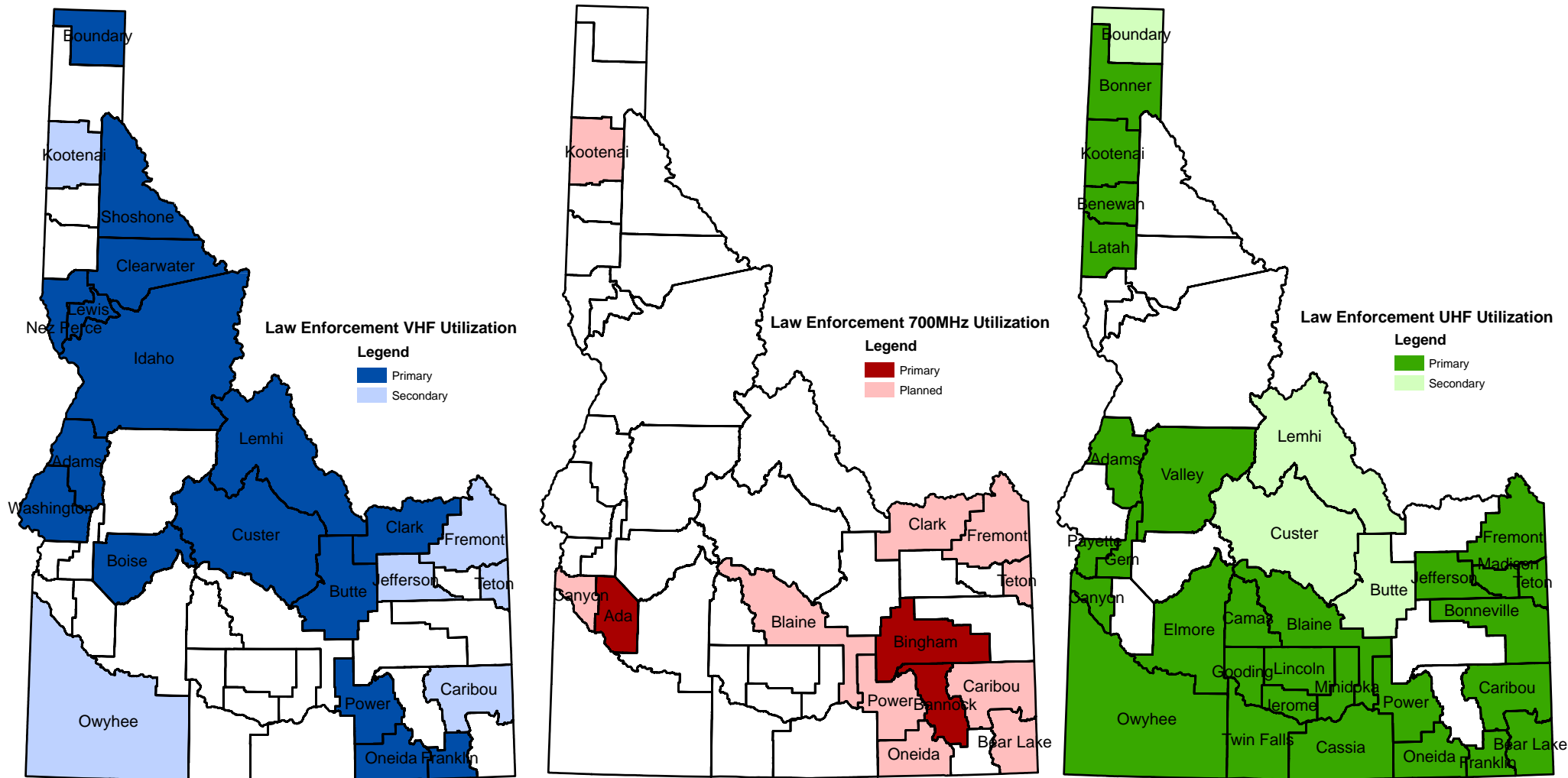
District 1  
District 2  
District 3  
District 5  
District 6

District 4  
Tribes

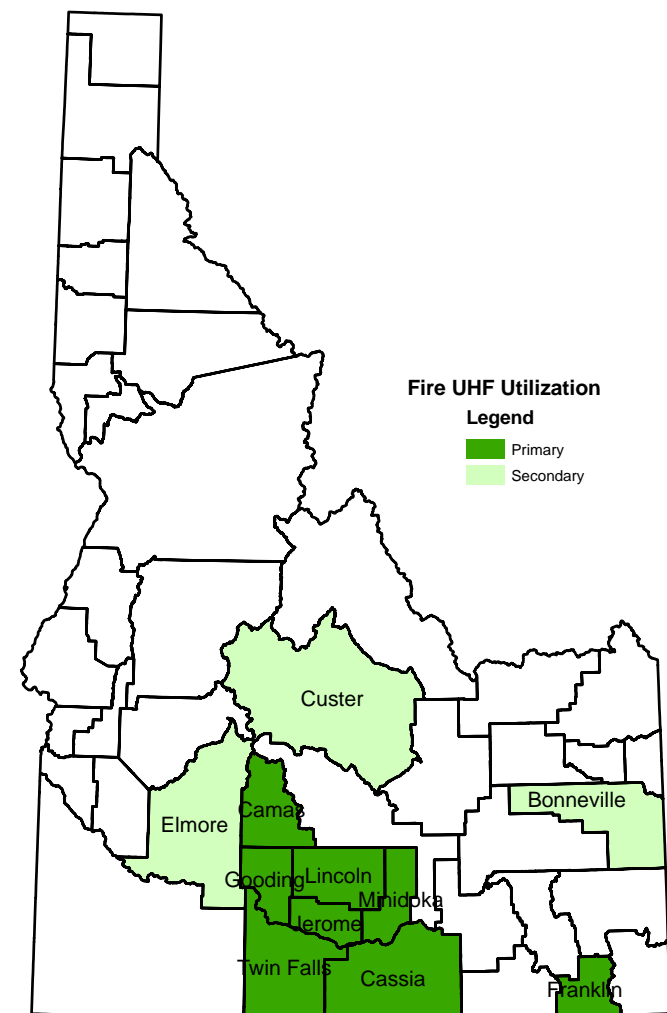
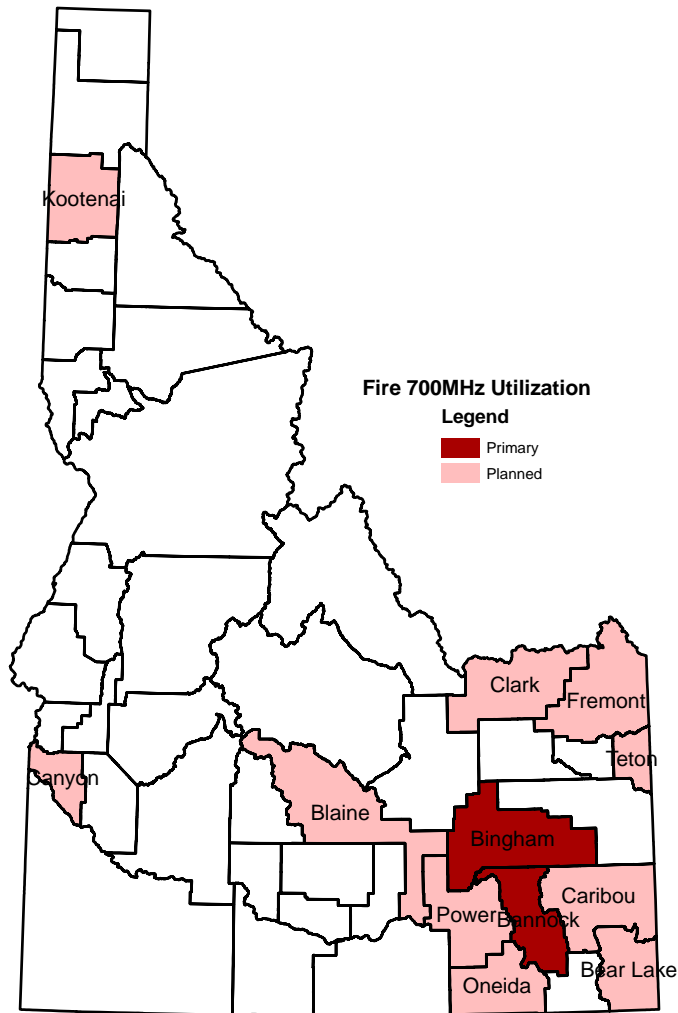
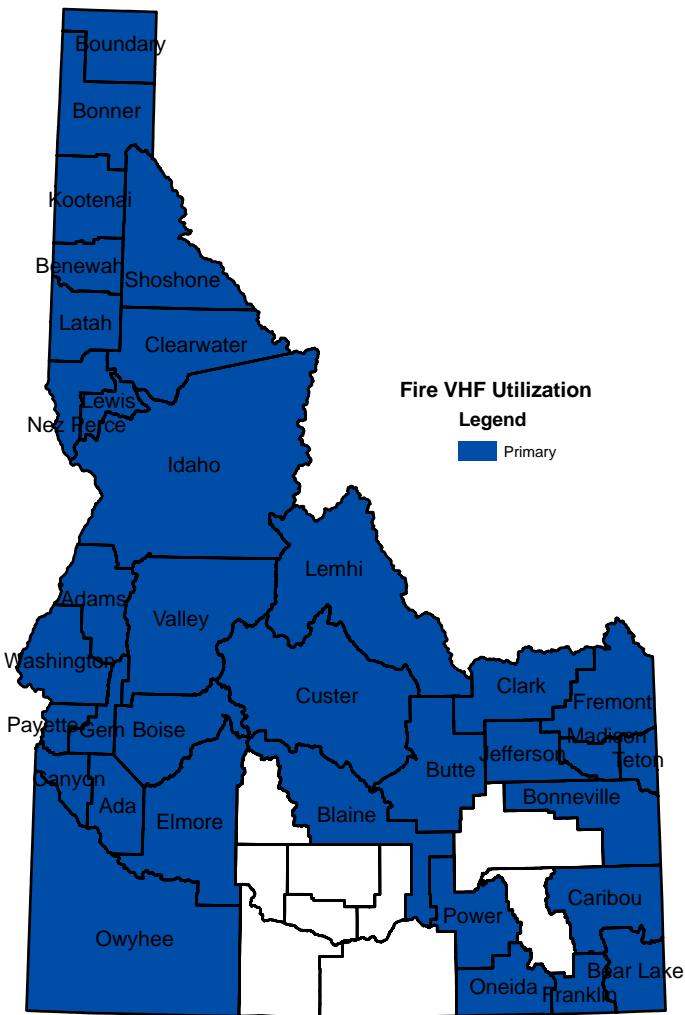
CTA Communications  
A Division of HSMM

HSMM | AECOM

**Figure ES-5**  
**Combined Law Enforcement Utilization**



# Figure ES-6 Combined Fire Utilization



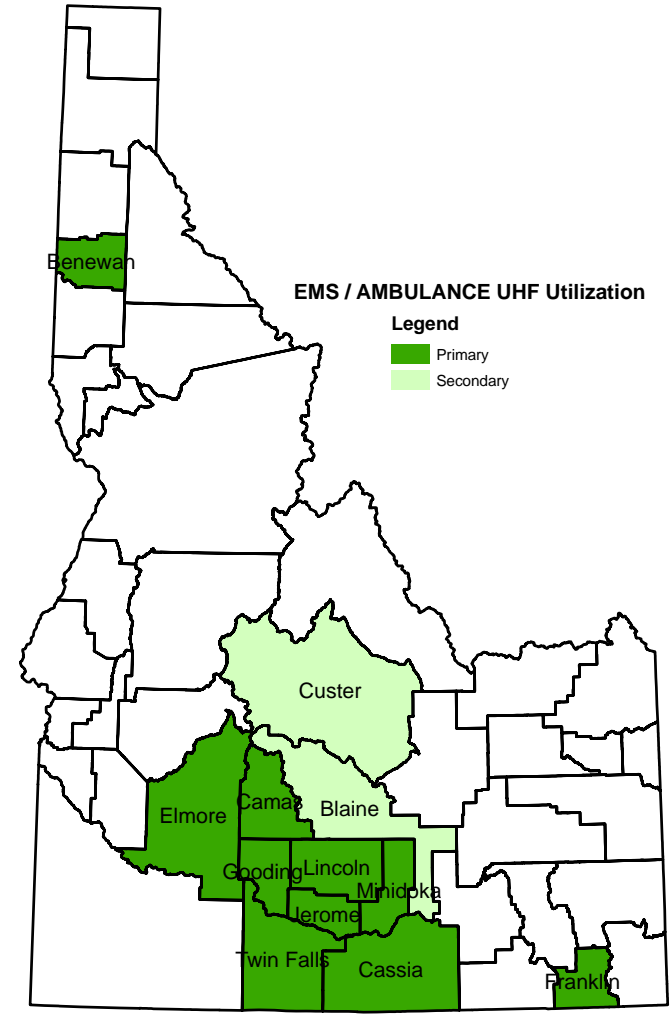
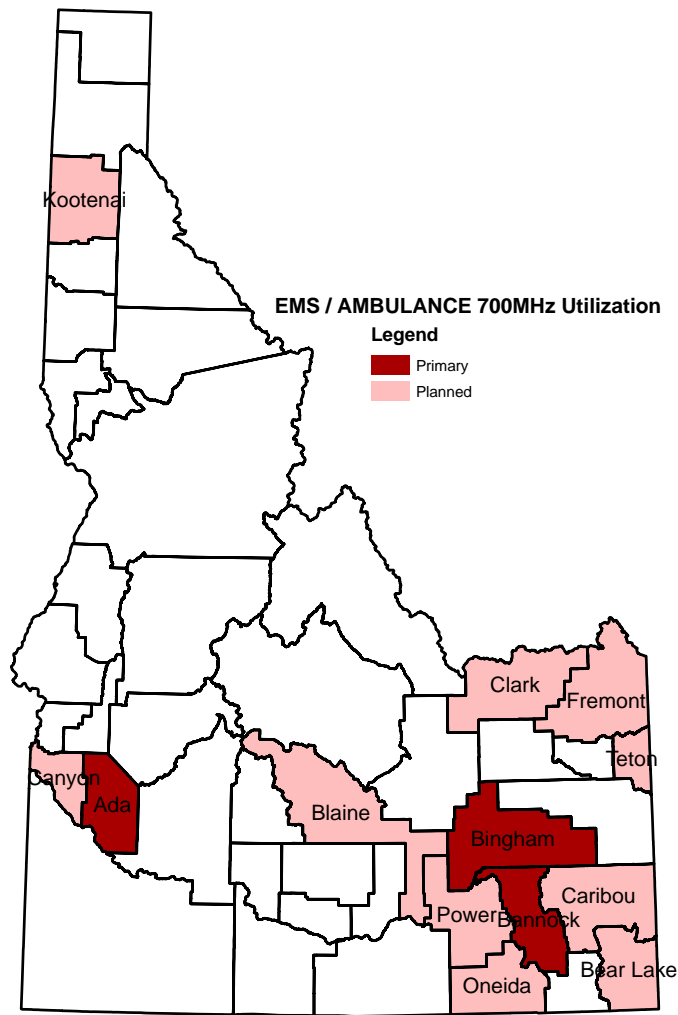
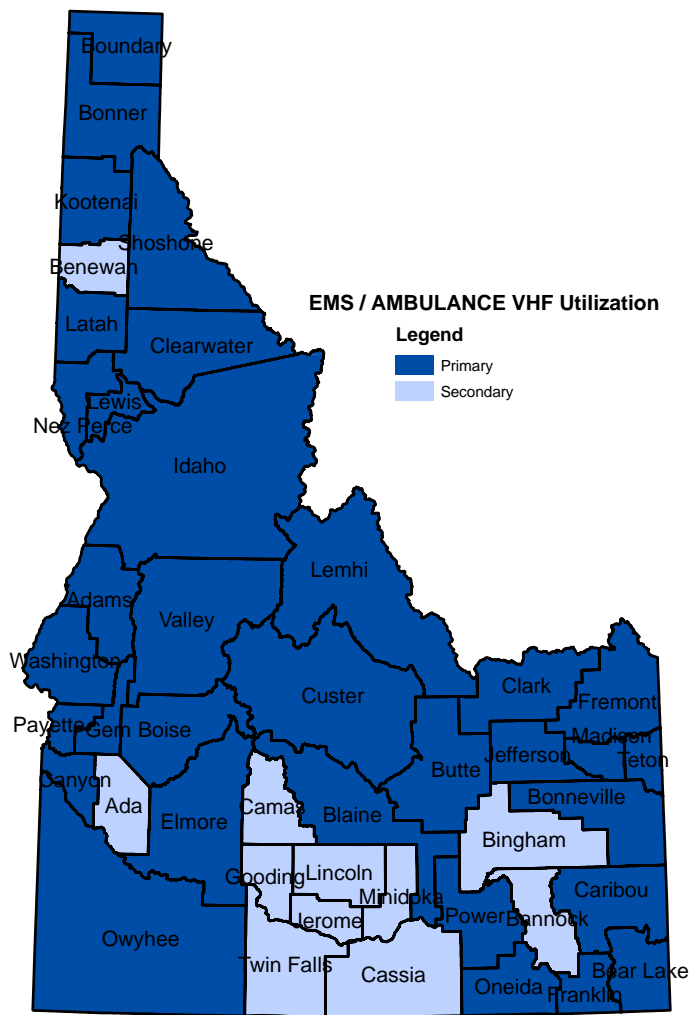
0 20 40 80 120 160  
Miles



CTA Communications  
A Division of HSMM

HSMM | AECOM

# Figure ES-7 COMBINED EMS/AMBULANCE UTILIZATION



0 20 40 80 120 160 Miles



CTA Communications  
A Division of HSMM

HSMM | AECOM

Providing

innovative and reliable solutions for the future